DOCUMENT RESUME

ED 168 689 PS 010 452

AUTHOR Ackerman, Brian P.
TITLE The Effect of Labeling on the Memory of Children and Adults of Pictorial Paired-Associates.
PUB DATE [78]
NOTE 25p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; Age Differences; Cognitive Development; Cognitive Processes; *Elementary School Students; Instruction; *Learning Processes; *Memorizing; *Paired Associate Learning; Pictorial Stimuli; *Recall (Psychological); Verbal Stimuli
IDENTIFIERS *Labeling; *Redintegration

ABSTRACT

This study investigates the role of labeling in developmental increases in picture recall. In two experiments, the memory for pictorial paired-associates of first graders or second graders, fourth graders and adults was evaluated by means of a study-test cued recall procedure. In Experiment 1, the stimulus presentation duration (on-time) and the interstimulus interval (off-time) were varied to allow or preclude the spontaneous use of labeling. In Experiment 2, half the subjects in each grade received labeling instructions, and recall was cued by means of either a picture or a picture label. In both experiments, the elements of the paired-associates were related either acoustically, conceptually, or not at all (neutral). This was done in order to determine the locus of the labeling effect and to enable the detection of labeling activity. The results showed that labeling instructions facilitated the recall of only the younger children, but that there were developmental differences in recall that could not be attributed to labeling differences. In addition, increases in the use of labeling were accompanied by increases in recall for the conceptually related pairs, suggesting that an important effect of labeling is to aid the processing of the conceptual information in pictures. (Author/RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED168689

The Effect of Labeling on the Memory of Children and Adults of Pictorial Paired-Associates

Brian P. Ackerman

Abstract

This study investigates the role of labeling in developmental increases in picture recall. In two experiments, the memory for pictorial paired-associates of first graders or second graders and fourth graders and adults was evaluated by means of a study-test cued recall procedure. In Experiment 1, the stimulus presentation duration (on-time) and the interstimulus interval (off-time) were varied to allow or preclude the spontaneous use of labeling. In Experiment 2, half the subjects in each grade received labeling instructions, and recall was cued by means of either a picture or a picture label. In both experiments, the elements of the paired-associates were related either acoustically, conceptually, or not at all (neutral). This was to determine the locus of the labeling effect and to enable the detection of labeling activity. The results showed that labeling instructions facilitated the recall of only the younger children, but that there were developmental differences in recall that could not be attributed to labeling differences. In addition, increases in the use of labeling were accompanied by increases in recall for the conceptually related pairs, suggesting that an important effect of labeling is to aid the processing of the conceptual information in pictures.

PS 010452

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Brian P. Ackerman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

The Effect of Labeling on the Memory of Children
and Adults of Pictorial Paired-Associates

Young children do not remember pictures as well as older children and adults do (Bird & Bennett, 1974; Mowbray & Luria, 1973). One explanation for this is that young children differ from older children and adults in the frequency with which pictures are labeled. Flavell (1970) considers children younger than six or seven to be production deficient in their failure to label pictures. In support of this hypothesis, several studies have shown that overt labeling of pictures aids the picture memory of young children, but has little effect on the memory of older children (Lynch & Rohwer, 1972; Mowbray & Luria, 1973).

Despite this evidence that labeling aids picture memory, the extent to which increases in labeling are responsible for developmental increases in picture memory is not known. For example, Scarborough's (1977) report that six-year-old children verbally encode pictures, suggests that increases in labeling activity with age may be small, in some situations. In addition, developmental differences may exist in processing visual information that are independent of differences in labeling. For example, children may not perform sensory and semantic analyses of the stimulus information as rapidly as adults do. To determine the extent of developmental processing differences that are independent of labeling differences, adults and children must be put in a situation that prevents the consistent use of labels. Any differences that exist in this condition cannot be attributed to labeling.

In addition, the locus of the developmental effects of labeling on memory for pictures is unknown. According to the dual coding hypothesis (Paivio, 1971, 1975), labeling is effective because a label supplies an additional verbal memory trace for a picture. The verbal trace may aid picture recall by facilitating the decoding of the pictorial input into a form suitable for verbal output in recall (Dilley & Paivio, 1968; Means & Rohwer, 1974; Rowher, 1970). The verbal trace may also work simply by increasing the quantitative probability that the

picture will be remembered (Paivio, 1971).

Both of these dual coding explanations locate the effect of labeling in retrieval, and may be considered retrieval hypotheses. An alternative explanation is that the primary effect of labeling is on the encoding of stimulus information. Thus explanation rests on the idea that generating a label for a picture requires the mediation of the semantic information in the picture (Nelson, Reed, & McEvoy, 1977). Thus labeling may facilitate the conversion of the visual information into a non-modality specific semantic form. In this case, the modality specific verbal trace would be only incidentally related to the major effect.

The present study attempts to determine the extent to which labeling is responsible for developmental differences in picture memory, and the locus of the facilitative effect of labeling. In two experiments young children and adults were presented with a sequence of pictorial paired-associates to study. At test, memory for the response member of each pair was assessed by means of a cued recall test, using the stimulus members of the paired-associates as cues. In the first experiment, the duration of the stimulus presentation time (on-time) and of the interstimulus interval (off-time) was varied to allow or to preclude the use of labeling. Stimuli were presented for either one second or five seconds, with an interstimulus interval also of either one second or five seconds. It was assumed that the limited encoding time of one second on-time/one second off-time would not permit the consistent use of labeling. Thus, any developmental differences that occur in this condition can be attributed to differences in encoding processes that are independent of labeling differences. It was also of interest to see if variations in on-time and off-time have independent effects on the recall of pictures, or different effects on the recall of children and adults. Though it is generally accepted that additional on-time allows increased verbal rehearsal of pictures (cf., Potter & Levy, 1969), Tversky and Sherman (1975), and Weaver

and Stanny (1978) found that changes in both on-time and off-time affect picture memory. Unlike the present study, both of these studies focused on recognition memory.

To determine the locus of developmental changes as a result of differences in the encoding of the pictorial information, the stimulus and response members of the paired-associates for each subject were related either acoustically, conceptually, or they were unrelated (neutral). Since the acoustic pairs share only a sensory relationship, recall for the acoustic cues should not be different from recall for the neutral cues unless labeling occurs. Thus, the degree to which young children and adults spontaneously label the pictures may be determined by comparing recall to these two cue types. The effect of labeling on the processing of the semantic information in the conceptual pairs, and on the subject's ability to elaborate a relationship between the members of the neutral pairs may be determined in a similar manner.

Method

Subjects. This experiment employed thirty six subjects from each of the first (mean age = 6;5 years, range, 6;0 to 6;11) and fourth grades (mean age = 9;5, range, 9;1 to 10;4) and thirty six college adults (mean age = 19;2, range 18;2 to 20;6). The children came from elementary schools serving a middle income community in Clinton, New York. The adults were paid volunteers from Hamilton College.

Design. Three levels of grade, two levels each of on-time and off-time, and three kinds of cue relationships were varied in a mixed factorial design, the last factor within subjects. The grade levels were first, fourth, and college; the on-time and off-time durations were one and five seconds; and the three kinds of cue relationships were acoustic, conceptual, and neutral.

Materials. Pictures of 108 common objects were taken from the Peabody Picture Vocabulary test or were drawn by hand. The pictures were chosen so that the picture names were within the reading vocabulary of second grade children, as determined from second grade reading books and the pictures could be easily and uniformly named by second grade children and college students alike. It was determined that the latter constraint was satisfied in a series of studies (cf., Ackerman & Emmerich, Note 1) in which second graders and adults were required to label the pictures.

Thirty of the objects were designated as targets. These constituted the response items in the stimulus-response pairs. Six of the target items were paired with unrelated objects. Two of these pairs served as pretraining stimuli; the remaining four pairs served as controls for possible primacy and recency effects. Twentyfour of the targets were critical for the test sequence. Each of these was paired with three of the remaining objects so that the target was acoustically related to one of the objects (Acoustic), conceptually related to another (Conceptual), and shared no relationship with the third (Neutral). These objects were placed in the stimulus position of the pairings and served as cues for recall. For the acoustically related pairs, the names of the pair members rhymed. For the conceptually related pairs, the pair members were semantically associated. The objects in this condition were paired so that they possessed a high associative frequency in the Palermo and Jenkins (1964) norms of highly associated concepts, where possible. Examples of the names of the target and cue items can be seen in Table 1.

Insert Table 1 about here

Slides were prepared of all the pairs, with the cue or stimulus items on the left side by side with the target or response items on the right. Slides were also prepared of each of the cue items alone.

Three acquisition lists of slide presentations were prepared. The target presentation order was the same for each list and was determined randomly, with the exception that the first two and last two list positions were filled by the slides designated as primacy and recency controls. Within each list, eight of the paired associates shared an acoustic relationship, eight shared a conceptual relationship, and eight were unrelated. Across the three lists, each target was shown in each kind of relationship with the stimulus cues. By presenting the targets with their cues in a fixed order and varying the cue relationships across the lists, the serial position of the cue relationships was controlled. Three test sequences were also prepared containing the cues that were seen in the related acquisition sequence. A different random cue presentation order was used for each subject in a cell, with the exception that the first four cues presented were from the slides in the primary and recency positions of the acquisition lists. The same order was used across the four cells of the between-subjects conditions.

The slides were rear-projected onto a screen by a Kodak Carousel projector. Timers controlled on-time by signalling a slide change at appropriate intervals and off-time by closing a shutter mounted on the projector's lens.

Procedure. Each subject was selected randomly and assigned to a presentation and list condition. Subjects were told that they would see slides containing pictures of two things together, and that they should try to remember what two things were together on the same slide. Subjects were told that after a series of these pairs were presented, memory for the pictures would be tested by presenting the object on the left (the cue) alone and asking the subjects to say what the item was paired with (the target).

Each subject was shown the pretraining slides, consisting of two cue-target pairs in a neutral relationship, followed by the two cues presented alone. All

subjects gave the correct responses for the cues. The subjects in the one second on-time conditions were further warned that the pictures would be presented at a very fast rate. After presentation of the 28 pairs (24 critical pairs, two primacy and two recency pairs), each subject was engaged in conversation for two minutes prior to the beginning of the test sequence. In the test sequence each cue was presented for five seconds. Responses given after this five second interval were also accepted. At the conclusion of the trial, each first grade subject was shown the pictures in the pairs, and asked to supply a verbal label for each picture presented individually. In every case, the supplied labels agreed with those assigned by the experimenter.

Results

The results for the number of response items correctly recalled were analysed by means of a 3(grade) x 2(on-time) x 2(off-time) x 3(cue relationship) mixed analysis of variance, the last factor within subjects. The means for each grade, level of on- and off-time, and cue relationship can be seen in Table 2.

Insert Table 2 About Here

The results showed main effects for grade, $F(3,96)=20.14$, $p<.001$, on-time, $F(1,96)=21.29$, $p<.001$, with recall in the five seconds condition greater than in the one second condition, off-time, $F(1,96)=22.35$, $p<.001$, again with recall in the five seconds condition greater than in the one second condition, and cue relationship, $F(2,192)=301.33$, $p<.001$. Tukey B analyses for grade showed that adult recall was significantly greater than fourth or first grade recall, which did not differ, and for cue relationship showed that recall for the conceptual cues was greater than for the acoustic cues, which exceeded recall for the neutral cues.

In addition, a significant interaction was obtained for grade and cue relationship, $F(4,192)=4.58$, $p<.01$. An analysis of simple effects and a subsequent

Tukey B analysis of this interaction showed that the increases in recall among grades occurred primarily for the acoustic and conceptual cue relationships (p's<.005), with much smaller increases occurring for the neutral items (p<.05).

Finally, though grade and cue relationship did not interact with the on-and off-time presentation conditions, the differences among grades for the one second on-time/one second off-time condition were examined individually since the experiment was designed to assess memory differences among grades under processing time limitations. As can be seen on Table 2, large recall differences occurred between the first graders and college students for the conceptual, $t(16)=2.58$, $p<.01$, and acoustic, $t(16)=4.95$, $p<.01$, cue relationships, but there were no differences in recall for the neutral cues. The performance of the fourth graders did not differ from the performance of either the first graders or the college students.

Discussion

Developmental changes in memory for pictures have been attributed to increases in the spontaneous use of labels by older children and adults (cf., Rohwer, 1970, 1973). This claim rests on two assumptions: that young children are deficient in their production of labels (cf., Flavell, 1970); and that no other kinds of processing differences exist between children and adults that are independent of labeling differences.

The present results indicate that six-year-old children do spontaneously label pictorial stimuli, to some extent. For example, the recall of these children to the acoustic cues was significantly greater than to the neutral cues. This result could not have occurred unless the children were labeling the stimuli,

since the acoustic cues were related to the targets only in terms of sensory similarity. Evidence supporting this conclusion can be found in the 1 second on-time/1 second off-time condition in which the first graders could not easily label the stimuli: recall for the acoustic cues did not exceed recall to the neutral cues. The logic of the experiment, of course, cannot eliminate the possibility that the first grade children were labeling even in this condition in a manner that would not be reflected in the use of the acoustic cues. However, this possibility does not detract from the main finding of a significant level of labeling activity for the first grade children.

It is also apparent that there are developmental changes in the use of labels, and other kinds of processing, and that these changes affect memory performance. For example, adults made significantly greater use of the acoustic cues than did the children in all the presentation conditions, indicating that adults labeled the pictures more than the children did. Adults also made better use of the neutral cues, suggesting the adults were better able to elaborate a relationship among the unrelated pair members. This finding supports Rohwer's (1973) claim that there are developmental increases in elaborative processing. Surprisingly, there were no differences in recall between the first and fourth graders. This result conflicts with the findings of other studies (e.g., Lynch & Rohwer, 1972). It suggests that encoding processes are employed in a like manner by children within this age range.

Unfortunately, no conclusions can be reached about the existence of developmental processing differences that are independent of labeling differences. The 1 second on-time/1 second off-time condition was employed, in this experiment, so that a comparison could be made of the recall of the children and the adults in a situation in which labeling could not occur. However, while the evidence

suggests that the children did not label in this condition, it is apparent that the adults did label the pictures with some consistency. Specifically, recall for the adults for the acoustic cues was significantly greater than recall for the neutral cues. Thus the developmental differences in recall in this condition could also be attributed to differences in labeling.

In what ways did labeling aid the recall of the pictures? In the present experiment, increases in recall to the acoustic cues both within and between grades were accompanied by similar increases in recall to the conceptual cues, but not necessarily to the neutral cues. This trend is particularly evident in the 1 second on-time/1 second off-time condition, where there were significant differences in recall between grades for the acoustic and conceptual cues, but no differences in recall for the neutral cues.

These results suggest that labeling aided the redintegration (Horowitz & Prytulak, 1969) of the conceptual paired-associates. That is, labeling enhanced the ability of the conceptual cues to reinstate the memory for the conceptual paired-associate compounds. Since the associative relationship between the members of the conceptual paired-associates existed prior to the beginning of the experiment, all that was required for redintegration of the pair members was to process the stimuli sufficiently so that the relationship was noted, i.e., so that at test the cue could access or locate the compound. Labeling facilitated the processing of the conceptual information in the stimuli.

In general, labeling had little effect upon the redintegration of the neutral items. For these items, redintegration of the pair members required elaborative processing of the stimuli so that a relationship was formed between the pair members. Labeling, per se, does not aid this kind of processing.

Finally the present data indicate that variations in both on-time and off-time had facilitative effects on the recall of pictures. These findings accord

with the findings of Tversky and Sherman (1975) and extend Weaver and Stanny's (1978) findings that similar variations affect recognition memory.

Experiment 2

In Experiment 1, it was assumed that increases in recall in the five second on-time and off-time conditions resulted primarily from increases in the use of labeling to verbally encode the pictorial stimuli. The evidence for this assumption was the increased use of the acoustic cues. However, this evidence is indirect, and it is possible the subjects employed encoding processes other than labeling in these conditions. In order to more directly investigate the specific effects of labeling on memory for pictorial paired-associates, in Experiment 2 half the subjects in each grade (second, fourth, college) were instructed to label the pictorial paired-associates used in Experiment 1, under conditions of five seconds on-time/ one second off-time. The presentation condition of five seconds on-time/ one second off-time was used to allow comparisons with other tasks that have manipulated labeling (cf., Lynch & Rohwer, 1972).

Instructing subjects to label, of course, cannot ensure that subjects will not spontaneously label in the no-label conditions. Indeed, both the evidence from Experiment 1. and the subject's knowledge of the verbal requirements of the recall task, suggest that subjects will label in this condition, to some degree. However, if labeling instructions increase the recall of the youngest children quantitatively, and effect the pattern of their results qualitatively by differentially affecting recall for the acoustic cues relative to recall for the neutral cues, it may be concluded that the second graders were not labeling consistently in the no-label conditions.

A further test of the effect of labeling was provided in Experiment 2, by employing cues at test that were either the pictures used in the stimulus position

in the paired-associates, or the verbal labels of the pictures presented as words. If labeling affects retrieval by providing a verbal memory trace for pictures (cf., Dilley & Paivo, 1968; Paivio, 1971; Rohwer, 1970), instructions should interact with cue modality at retrieval for those subjects who do not consistently label the pictures (i.e., the second graders). In particular, word cues should show an especially dramatic gain in effectiveness under labeling instructions because the word cues, in the no-label condition, are not coded in a form that will redintegrate the pictorial stimuli. The picture cues, in the no-label condition, are congruent with the input modality, and can access the stimuli in memory. Labeling in this condition will aid verbal output but will not affect redintegration of the stimuli.

Method

Subjects. Thirty six subjects were drawn from each of the second (mean age = 7;5, range, 7;3 to 8;4) and fourth (mean age = 9;7, range, 8;10 to 11;0) grades, and from the college population (mean age = 19;0, range 17;10 to 21;1) used in experiment 1. None had participated in Experiment 1. Second grade subjects were used, rather than the first graders used in Experiment 1, to ensure that the word cues would be easily read.

Design. A 3 (grade) x 2 (instructions) x 2 (cue modality) x 2 (trials) x 3 (cue relationship) mixed factorial design was used, the last factor within subjects. Concerning the factors different from those of Experiment 1, the subjects were instructed to label the acquisition stimuli or given no instruction; and the cue modality was either a picture or a word.

Materials. The materials employed were the same as in Experiment 1, with the exception that slides were prepared of the verbal labels of each of the picture cues.

Procedure. The procedure varied from that of Experiment 1 in that prior to presentation of the pretraining slides, the subjects in the labeling conditions were told to say the name of the objects presented on each slide, starting with the objects on the left (the cues) and asking what these objects went with (the targets). The pretraining sequence illustrated the labeling and the word cue modality variations for these subjects. The other subjects were instructed as in Experiment 1. All subjects responded appropriately in the pretraining sequence.

At the conclusion of the testing sequence, each of the second grade subjects in the word cue modality condition was shown the cue words and asked to read each word. None of the subjects had difficulty with any of the words.

Results

The data were analyzed by means of a 3 (grade) x 2 (instructions) x 2 (cue modality) x 3 (cue relationship) mixed analysis of variance, the last factor within subjects. The means for each grade under label or no-label instructions for each cue modality and cue relationship can be seen in Table 3.

Insert Table 3 About Here

There were main effects for grade, $F(2,96)=31.96$, $p<.001$, and cue relationship, $F(2,192)=230.93$, $p<.001$. Tukey B analyses of these effects showed that adults recalled more than fourth graders, who recalled more than the second graders, and that recall for the conceptual cues was greater than recall for the acoustic cues, which was greater than recall for the neutral cues. There were no main effects for either instructions or cue modality.

There was, in addition, an interaction of grade and instructions, $F(2,96)=4.68$, $p\leq.025$. This was due to the fact that labeling facilitated the recall of the second graders, $F(1,32)=6.77$, $p<.01$, but had a slightly negative effect on the recall of the adults. A closer look at the effect of labeling instructions

on the recall of the second graders indicated that labeling instructions dramatically improved recall for the pictorial cues, and had no effect on recall for the word cues, relative to the no-label condition. The strength of this interaction for the second graders was largely responsible for a similar overall interaction of instructions and cue modality, $F(1,96)=4.93$, $p<.05$. For the second graders, labeling improved recall for the picture cues for the conceptual, $t(16)=2.40$, $p<.025$, and the acoustic, $t(16)=4.02$, $p<.001$ cue relationships, but not for the neutral cue relationship.

Discussion

This experiment attempted to determine if young children can benefit from instructions to overtly label pictorial stimuli, and if the facilitative effect of labeling occurs at encoding or retrieval. The results showed that labeling instructions increased the recall of the second graders and reduced developmental differences in recall. Labeling instructions also affected the recall of the second graders in a qualitative manner. For example, labeling instructions increased recall to the acoustic cues, relative to the no-label conditions, but had no effect on recall to the neutral cues. These findings indicate that the second graders did not consistently label in the no-label conditions, and that second grade children can benefit from labeling instructions. In contrast, the recall of the other groups did not vary with instructions, and was consistently greater for the acoustic than for the neutral cues. Subjects in these grades apparently supplied labels for the stimuli on their own.

How did the labeling instructions affect recall for the pictorial stimuli in this experiment? For the second grade children, labeling instructions had little effect on recall for the neutral cues. This parallels the results of Experiment 1, where increases in recall to the acoustic cues were not consistently accompanied by increases in recall to the neutral cues. These findings suggest, first, that labeling does not stimulate the elaborative processing needed to integrate unrelated items, and, second, that simply providing a verbal memory trace of a

pictorial item is not sufficient to promote recall of the item. Labeling per se helps children little; the label must offer the child a relationship to encode.

Labeling instructions also had little effect on the second grader's use of the word cues to aid recall. If labeling aids retrieval by providing a verbal analogue for the pictorial item (cf., Rohwer, 1970), labeling instructions should have benefited recall to the word cues more than recall to the picture cues. In both the cue modality conditions, labeling would aid the decoding of the input pictures into a form suitable for verbal output. However, in the word condition, labeling at input should also have been necessary to ensure that the pictorial stimuli were in a form that could be accessed by the word cues at retrieval. Instead the results showed that the second graders made better use of the word cues relative to the picture cues in the no-label condition, and that the use of the word cues did not vary with instructions. This indicates that the primary effect of labeling was not at retrieval. This finding agrees with the findings of Means and Rohwer (1974) for children this age.

The major effect of labeling was on the use of the picture cues. This was reflected in the overall instructions by cue modality interaction where labeling instructions facilitated recall to the picture cues, especially for the second graders. As can be seen in the means on Table 3, labeling instructions strongly affected the use of the acoustically related picture cues, relative to the no-label instructions. As might be expected, redintegration in this case required the verbal coding of the pictorial items. However, labeling instructions also strongly affected the use of the conceptually related picture cues. Generating labels for the pictures apparently facilitated the processing of the conceptual information in the items. Give that the conceptual bonds between the paired associates existed prior to the experiment in a non-modality specific form

(neither visual nor verbal), the major effect of labeling may have been to stimulate the encoding of the pictorial information in the paired-associates into a non-modality specific conceptual form, thus facilitating the redintegration of the associates by the conceptual cue. In the no-label condition, the conceptual relation between the paired-associates could not have been accessed consistently, because the pictorial cues did not benefit as much from the pre-existing relationship between the items. The use of the conceptual word cues may not have been similarly affected by labeling because the sensory incongruence between the encoding and retrieval conditions may have required the mediation of conceptual information in transferring from a visual to an acoustic sensory modality (Nelson, Reed, & McEvoy, 1977). Further research will be needed to substantiate this point.

General Discussion

The experiments reported in this study were concerned with examining the role of labeling in developmental increases in picture memory. The results of Experiment 1 converge with those of Experiment 2 to demonstrate that increases in labeling have limited responsibility for developmental changes in picture memory. For example, both experiments found that young children do spontaneously label pictorial stimuli to some extent. The evidence for this conclusion is that recall to the acoustic cues was greater than recall to the neutral cues both for the first graders in Experiment 1 in the longer presentation conditions, and for the second graders in Experiment 2 in the no-label instructional conditions. In addition, in Experiment 2, though the recall of the second graders was facilitated by the labeling instructions, there were still huge developmental differences in recall between the children and the adults. These findings suggest that young children are not as deficient in producing labels as previous research has indicated (cf., Flavell, 1970) and that the effect of

increased labeling activity in reducing developmental differences in picture recall is not powerful. It should also be pointed out that in both of the present experiments the differences between the recall of the youngest children (first or second graders) and the recall of the fourth graders were small. This is a surprising finding, and it indicates that a great deal of continuity exists between the encoding of paired-associate information employed by these age groups. It is not clear why there were small differences in Experiment 2 that were not found in Experiment 1.

Though the labeling instructions did not account for much of the variance in recall between grades, labeling instructions had a powerful facilitative effect on the recall of the second grade children in Experiment 2. This finding agrees with those of Lynch and Rohwer (1972) and Mowbray and Luria (1973). It indicates that second grade children are deficient in labeling and that increased proficiency in this regard will aid their recall.

Finally, as several theorists have predicted (cf., Dilley & Paivio, 1968; Paivio, 1971, 1975; Rohwer, 1970), there was evidence that one effect of labeling is to supply an additional verbal memory trace for the pictures. For instance, both overt labeling in Experiment 2, and the increased opportunity to label in Experiment 1 increased the use of the acoustic cues. However, the primary effect of labeling appears to be that labeling speeds the processing of the semantic information in the pictorial stimuli. That is, labeling aids the translation of modality specific visual information into a non-modality specific conceptual form. For example, in both experiments, increases in the use of the acoustic cues resulted in similar increases in the use of the conceptual cues. The same did not occur for the use of the neutral cues. In addition, picture cues in Experiment 2 were better able to effect redintegration of the conceptual

relationships when the pictures were labeled. The effect of labeling here may be to facilitate the encoding of the pictorial information in the stimuli into a non-sensory form that can be accessed by the conceptually related cue. The existence of the verbal memory trace may be incidental.

Though labeling may facilitate the access of a semantic level of processing, possibly because conceptual information has to mediate the generaiton of a label for a picture (Nelson, Reed, & McEvoy, 1977), labeling does not particularly aid the elaborative processing of the stimuli (cf., Craik & Tulving, 1975). In these experiments, labeling had little effect on the elaborative processing needed to integrate the unrelated items. This finding is of particular importance to the logic of both experiments, since it argues against the hypothesis that the effect of labeling can be attributed to general increases in activation level or in attention to the stimuli. Instead the effect of labeling is selective.

Taken together, the findings in the two experiments that young children do not label as consistently as adults do and that labeling aids redintegration of conceptual relationships, suggest that young children differ from older children and adults primarily in the ease with which the young children encode the semantic information in pictures. This may be due to the difficulty of translating modality specific visual information into a non-modality specific form. Any encoding activity, then, that facilitates the processing of the semantic information in pictures by young children, should reduce developmental differences in recall for pictures.

Reference Notes

1. Ackerman, B.P., & Emmerich, H.J. The pictorial superiority effect in childr n and adults. Unpublished paper.

2. Means, B.M., & Rohwer, W.D. A developmental study of the effects of adding verbal analogs to pictured paired associates. Unpublished paper, University of California, Berkeley, 1974.

References

Bird, J.E., & Bennett, A.F. A developmental study of recognition of pictures and nouns. Journal of Experimental Child Psychology, 1974, 18, 117-126.

Craik, F.I.M., & Tulving, E. Depth of processing and the retention of words in episodic memory. Journal of Experimental Psychology: General, 1975, 1, 268-294.

Dilley, M.G., & Paivo, A. Pictures and words as stimulus and response items in paired-associate learning in young children. Journal of Experimental Child Psychology, 1968, 6, 231-240.

Flavell, J.H. Developmental studies of mediated memory. In H.W. Reese & L.P. Lipsitt (eds.), Advances in child development and behavior, Vol. 5, New York: Academic Press, 1970.

Horowitz, L.L., & Prytulak, L.S. Redintegrative memory. Psychological Review, 1969, 76, 519-531.

Lynch, S., & Rohwer, W.D. Grade interaction with words and pictures in a paired-associate task: A proposed explanation. Journal of Experimental Child Psychology, 1972, 13, 413-421.

Mowbray, G.T., & Luria, Z. Effects of labeling on children's visual imagery. Developmental Psychology, 1973, 9, 1-8.

Nelson, D.L., Reed, V.S., & McEvoy, C.L. Learning to order pictures and words: A model of sensory and semantic encoding. Journal of Experimental Psychology: Human Learning and Memory, 1977, 5, 485-497.

Paivio, A. Imagery and verbal processes. New York: Holt, Rinehart, & Winston, 1971.

Paivio, A. Coding distinctions and repetition effects in mrmory. In G.H. Bower (Ed.), The psychology of learning and motivation, Vol. 9. New York. Academic Press, 1975.

Palermo, D.S., & Jenkins, J.J. Word association norms: grade school through college. Minneapolis: University of Minnesota Press, 1964.

Potter, M.C., & Levy, E.I. Recognition memory for a rapid sequence of pictures. Journal of Experimental Psychology, 1969, 81, 10-15.

Rohwer, W.D., Images and pictures in children's learning: Research results and educational implications. Psychological Bulletin, 1970, 73, 393-403.

Rohwer, W.D. Elaboration and learning in childhood and adolescence. In H.W. Reese (Ed.), Advances in child development and behavior, Vol. 8., New York: Academic Press, 1973.

Scarborough, H.S. Development of visual, name, and conceptual memory codes for pictures. Journal of Experimental Child Psychology, 1977, 24, 191-211.

Tversky, B., & Sherman, T. Picture memory improves with longer on time and off time. Journal of Experimental Psychology: Human Learning and Memory, 1976, 2, 509-522.

Weaver, G.E., & Stanny, C.J. Short-term retention of pictorial stimuli as assessed by a probe recognition technique. Journal of Experimental Psychology: Human Learning and Memory, 1978, 4, 55-65.

Table 1

Examples of the stimulus and response members of the paired-associates, related in an acoustic, conceptual, or a neutral manner.

Response	Stimulus Cue		
Target	Acoustic	Conceptual	Neutral
Mop	Top	Pail	Anchor
Hook	Book	Fishing Rod	Fence
Pear	Bear	Apple	Fireplace
Key	Bee	Door	Camel
Nail	Whale	Hammer	Stove
Cake	Rake	Pie	Grill
Tree	Pea	Leaf	Shoe

Table 2

Mean number recalled and standard deviations (in parentheses) for each grade, for variations in stimulus on-time and off-time (in seconds), and cue relationship

First	Acoustic	Conceptual	Neutral
1 on/1 off	1.22(1.09)	3.44(1.86)	.89(.57)
1 on/5 off	3.00(1.63)	5.78(.92)	1.33(.82)
5 on/1 off	1.89(.57)	5.21(1.97)	1.33(.67)
5 on/5 off	3.00(1.37)	6.00(1.05)	2.56(1.50)
Fourth			
1 on/1 off	1.67(1.05)	4.44(2.45)	1.00(.67)
1 on/5 off	3.33(1.23)	5.11(.87)	1.67(1.41)
5 on/1 off	2.00(.94)	6.11(.74)	1.67(1.25)
5 on/5 off	2.22 (.92)	6.00(.67)	2.00(.79)
College			
1 on/1 off	2.67(.94)	5.33(.94)	.89(.39)
1 on/5 off	4.78(1.23)	5.67(1.63)	2.11(1.29)
5 on/1 off	4.56(1.71)	7.77(1.10)	2.78(1.44)
5 on/5 off	5.67(1.94)	7.00(1.05)	3.78(2.94)

Table 3

Mean number recalled and standard deviations (in parentheses) for each grade, for each kind of instruciton, cue modality, and cue relationship.

		Acoustic	Conceptual	Neutral
Second				
Label	Pictures	3.67(1.05)	5.44(1.42)	.89(.67)
	Words	3.11(1.94)	4.56(1.15)	1.33(.68)
No-label	Pictures	2.11(.79)	4.00(1.40)	1.00(.92)
	Words	3.22(1.49)	4.11(1.42)	.89(.67)
Fourth				
Label	Pictures	4.00(1.89)	6.22(1.31)	1.56(1.34)
	Words	3.67(2.21)	5.22(1.93)	1.33(.94)
No-Label	Pictures	2.67(1.63)	5.67(1.49)	1.00(1.15)
	Words	3.11(1.45)	4.56(1.89)	.78(.79)
College				
Label	Pictures	5.67(1.15)	6.89(1.10)	2.67(1.25)
	Words	4.78(1.69)	5.56(1.64)	1.78(1.75)
No-Label	Pictures	5.11(1.73)	6.89(.74)	3.11)1.59)
	Words	5.33(1.33)	6.44(1.83)	4.33(1.56)